CLAIMS

What is claimed is:

1. A method for producing laser radiation from an Er-doped solid-state crystal laser device, the method comprising the steps of:

   (a) activating a laser diode to produce an output emission having a predetermined wavelength;

   (b) coupling a guided-wave laser to receive the output emission of the laser diode, wherein the output emission of the laser diode stimulates the guided-wave laser to produce a guided-wave laser output emission;

   (c) coupling the guided-wave laser output emission to upper-state pump the Er-doped solid-state crystal laser device, wherein the guided-wave laser output emission stimulates the solid-state crystal laser device to produce the laser radiation.

2. The method of claim 1, wherein the Er-doped solid-state crystal comprises material selected from the group of yttrium aluminum garnet (YAG), yttrium scandium gallium garnet (YSGG), gadolinium scandium gallium garnet (GSGG), gadolinium scandium aluminum garnet (GSAG), gadolinium gallium garnet (GGG), lutetium aluminum garnet (LuAG), yttrium gallium garnet (YGG), yttrium aluminum oxide (YALO), yttrium vanadate (YVO_4) and yttrium lithium flouride (YLF).

3. The method of claim 1, wherein the Er-doped solid-state crystal comprises material selected from the group of yttrium aluminum garnet (YAG), yttrium scandium gallium garnet (YSGG), and gadolinium scandium gallium garnet (GSGG).

4. The method of claim 1, wherein the Er-doped solid-state crystal comprises yttrium aluminum garnet (YAG).

5. The method of claim 1 wherein the guided-wave laser comprises an Yb,Er-doped fiber laser.

6. The method of claim 1 wherein the guided-wave laser comprises an Yb,Er-doped waveguide laser.

7. The method of claim 1 wherein the output emission of the laser diode is limited to a wavelength of 0.9 to 1.0 microns.

8. The method of claim 1 wherein the output emission of the laser diode is limited to a wavelength of 0.96 to 0.98 microns.

9. The method of claim 1 wherein the guided-wave laser comprises a Raman-shifted Yb-doped fiber laser.

10. The method of claim 1 wherein the guided-wave laser comprises a Raman shifted waveguide laser.

11. The method of claim 1 wherein the guided-wave laser comprises a Raman-shifted Nd-doped fiber laser.

12. The method of claim 1 wherein the guided-wave laser comprises a Raman-shifted Nd-doped waveguide laser.

13. The method of claim 1 wherein the guided-wave laser output emission is limited to a wavelength of 1.45 to 1.54 microns.

14. The method of claim 1 wherein the guided-wave laser output emission is limited to a wavelength of 1.528 to 1.536 microns.

15. The method of claim 1 wherein the guided-wave laser output emission is limited to a wavelength of 1.533 to 1.534 microns.

16. The method of claim 1, wherein step (c) further comprises the step of Q-switching the Er-doped solid-state crystal laser.

17. The method of claim 16, wherein step (c) further comprises the step of utilizing a long energy storage lifetime within the Er-doped solid-state crystal laser to enable the production of Q-switched output having high pulse energies.

18. The method of claim 16, wherein step (c) further comprises the step of limiting the output pulsewidth to between 0.1 microseconds and 1 microsecond.

19. The method of claim 1, wherein step (c) further comprises the step of pumping the Er-doped solid-state crystal laser to produce laser radiation at a predetermined wavelength of 1.55 to 1.7 microns.

20. The method of claim 1, wherein step (c) further comprises the step of pumping the Er-doped solid-state crystal laser to produce laser radiation at a predetermined wavelength of 1.643 to 1.648 microns.

21. The method of claim 1, wherein step (c) further comprises the step of pumping the Er-doped solid-state crystal laser to produce laser radiation at a predetermined wavelength of 1.644 microns to 1.645 microns.

22. The method of claim 1, where an Er dopant concentration of the Er-doped solid-state crystal laser is less than 5%.

23. The method of claim 1, where an Er dopant concentration of the Er-doped solid-state crystal laser is less than 2%.

24. The method of claim 1, where an Er dopant concentration of the Er-doped solid-state crystal laser is less than 1%.

25. A device for producing laser radiation comprising:

a laser diode having an output emission at a predetermined wavelength;

a guided-wave laser coupled to receive the output emission of the laser diode, wherein the output emission of the laser diode pumps the guided-wave laser to create a guided-wave laser output emission;

an Er-doped solid-state crystal laser coupled to receive the guided-wave laser output emission wherein the guided-wave laser output emission upper-state pumps the solid-state laser to produce the laser radiation.

26. The device of claim 25, wherein the Er-doped solid-state crystal comprises material selected from the group yttrium aluminum garnet (YAG), yttrium scandium gallium garnet (YSGG), gadolinium scandium gallium garnet (GSGG), gadolinium scandium aluminum garnet (GSAG), gadolinium gallium garnet (GGG), lutetium aluminum garnet (LuAG), yttrium gallium garnet (YGG), yttrium aluminum oxide (YALO), yttrium vanadate (YVO_4) and yttrium lithium flouride (YLF).

27. The device of claim 25, wherein the Er-doped solid-state crystal comprises material selected from the group yttrium aluminum garnet (YAG), yttrium scandium gallium garnet (YSGG), and gadolinium scandium gallium garnet (GSGG).

28. The device of claim 25, wherein the Er-doped solid-state crystal comprises yttrium aluminum garnet (YAG).

29. The device of claim 25 wherein the guided-wave laser comprises an Yb,Er-doped fiber laser.

30. The device of claim 25 wherein the guided-wave laser comprises an Yb,Er-doped waveguide laser.

31. The device of claim 25 further comprising limiting the output emission of the laser diode to a wavelength of 0.9 to 1.0 microns.

32. The device of claim 25 further comprising limiting the output emission of the laser diode to a wavelength of 0.96 to 0.98 microns.

33. The device of claim 25 wherein the guided-wave laser comprises a Raman-shifted Yb-doped fiber laser.

34. The device of claim 25 wherein the guided-wave laser comprises a Raman-shifted Yb-doped waveguide laser.

35. The device of claim 25 wherein the guided-wave laser comprises a Raman-shifted Nd-doped fiber laser.

36. The device of claim 25 wherein the guided-wave laser comprises a Raman-shifted Nd-doped waveguide laser.

37. The device of claim 25 further comprising limiting the guided-wave laser output emission to a wavelength of 1.45 to 1.54 microns.

38. The device of claim 25 further comprising limiting the guided-wave laser output emission to a wavelength of 1.528 to 1.536 microns.

39. The device of claim 25 further comprising limiting the guided-wave laser output emission to a wavelength of 1.533 to 1.534 microns.

40. The device of claim 25, further comprising a Q-switch for Q-switching the Er-doped solid-state crystal laser.

41. The device of claim 40, further comprising utilizing a long energy storage lifetime within the Er-doped solid-state crystal laser to enable the production of Q-switched output having high pulse energies.

42. The device of claim 40, further comprising limiting the output pulsewidth to between 0.1 microseconds and 1 microsecond.

43. The device of claim 25, wherein the Er-doped solid-state crystal laser produces laser radiation at a predetermined wavelength of 1.55 to 1.7 microns.

44. The device of claim 25, wherein the Er-doped solid-state crystal laser produces laser radiation at a predetermined wavelength of 1.643 to 1.648 microns.

45. The device of claim 25, wherein the Er-doped solid-state crystal laser produces laser radiation at a predetermined wavelength of 1.644 microns to 1.645 microns.

46. The device of claim 25, further comprising an Er dopant concentration of the Er-doped solid-state crystal laser of less than 5%.

47. The device of claim 25, further comprising an Er dopant concentration of the Er-doped solid-state crystal laser of less than 2%.

48. The device of claim 25, further comprising an Er dopant concentration of the Er-doped solid-state crystal laser of less than 1%.